



E/CONF.39/D/25

29 Sept. 1962

ORIGINAL : ENGLISH

**UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS**

Agenda Item: D.5.4

United Kingdom

**NEW SOURCES OF ESSENTIAL OILS
IN TROPICAL COUNTRIES**

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NEW SOURCES OF ESSENTIAL OILS IN TROPICAL COUNTRIES

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(a) Uses of Essential Oils and their Value as Cash Crops.

1. The widespread use of perfumes and flavouring materials is characteristic of the civilized way of life and it is readily observed that any rise in the standard of living of a country brings increased interest in their use. Essential oils, either in their isolated form, or as occurring naturally in spices and herbs, are the traditional basis for perfumes and flavours and, although synthetic products from the organic chemical industry are available and take a part of the expanding market, the natural products hold their own by their unique qualities.
2. A section of the Tropical Products Institute specialises in essential oils and spices. The work involves the development of new sources, the assessment of the quality of the products, and research into the composition of new materials.
3. Essential oils are particularly valuable as cash crops for inaccessible areas, since as their name implies, they are the "essence" or distillate of the plants from which they are obtained, and their relatively high price per pound will, in many cases repay air freight or a difficult road haul.

(b) Assessment of the Market Aspects for an Essential Oil.

4. The proposal to develop a new essential oil cash crop by a territory wishing to broaden its economy, must be considered from various aspects. Obviously the potential market for a particular oil is the first consideration and a wide circle of trade contacts with whom the various factors can be discussed is a basic requirement. The Institute is well placed in this respect and in addition, has an Economics and Statistics Division which carries out surveys and collects statistics. A knowledge of the industry, built up over the years, is of great importance in judging the market prospects for an oil since price movements within a short space of time are no indication of the true state of the market and a sudden scare or enthusiasm about the replacement of, or new demand for, a particular oil, needs to be seen in perspective.

(c) Cultivation Trials.

5. Although it is possible to give general information about the cultivation and other requirements of a particular crop, no external body can provide advice comparable in value with that which the local Department of Agriculture can give after planting trials with a new species have been carried out. Not only are these trials necessary to discover if the plant will flourish in its new habitat, they are also vital to find out what effect the new environment has on the quality

of the oil. As an instance of this an attempt may be mentioned to produce Malayan type patchouli oil in the Seychelles. Although the native Seychelles patchouli oil is of very good quality, some buyers prefer the Malayan type and for this reason plants of Pogostemon cablin Benth. were obtained from Singapore and grown by the Department of Agriculture in the Seychelles. When a consignment of leaves from these plants was distilled at the Institute, however, the oil was found to have the properties of Seychelles, and not of Malayan patchouli oil. The effect of the environment evidently predominated over any varietal or other minor botanical difference in the plants.

(d) Evaluating the Quality of the Oil.

6. The testing of oils produced in preliminary trials is, in the first case, the determination of analytical constants to see if they satisfy the requirements laid down in Pharmacopoeias or by Standards Institutions. Such analytical constants, however, give only broad indication of the quality of the oil; more precise information can be obtained by the modern technique of gas chromatography which gives a "picture" of the oil in respect of its volatile constituents and enables a clear comparison to be made with the picture produced under the same conditions by the instrument from a reference sample. Finally, and this is the most important test of all where odour and flavour are concerned, the material is tested organoleptically by people in the trade who handle the particular oil regularly as part of their daily business. If the oil appears promising, but not quite "up to standard" it may often be possible to suggest steps which might be taken to improve it, e.g. loss of the more volatile portion ("top-note") might be due to over-rapid distillation of the oil in the initial stages; a pronounced "terpene" odour could be the result of harvesting insufficiently mature plants when terpene hydrocarbons predominate in the oil but which later, in the mature plants, are partially replaced by esters and alcohols and other oxygenated compounds.

(e) Distillation.

7. The knowledge that an oil of satisfactory quality can be produced and which trade users think will find a market, is the basis from which full production, first on a pilot scale, and then expanding according to circumstances, can commence. There are, however, many difficulties which have to be overcome before any substantial development is achieved.
8. If the crop has been developed by the Agricultural Department, individual growers must be found willing both to grow it and at the same time to master the technique of distillation (not in fact very difficult, but often seeming to be to those only accustomed to normal agricultural processes). The distillation set-up usually consists of a separate steam boiler, the still itself and the condenser, together with the necessary connecting pipes. The plant material is placed in the still, usually on a perforated support to keep it clear of the steam coils, and steam blown through the charge carries the oil vapour with it into the condenser. The mixture of essential oil and water emerging from the condenser separates into two layers. The oil is generally filtered and dried before being placed in its container. In some instances, where the oil is partly soluble in water, the water layer is returned to the still (a process known as "cohabitation"). Here it is evaporated by the closed steam coil in the base of the still to give more steam for the distillation and liberate its dissolved oil. In effect, this process reduces the total volume of water used in the distillation and hence the oil lost by solution. Where a boiler of adequate capacity is already available at a factory, e.g. a sugar refinery, near the growing area, the still may be sited near it. The material used for the still body itself is not important but the condenser must not be made from a metal which can spoil the oil. Generally speaking,

advice should be taken on the design of this unit from technicians well acquainted with the distillation process as applied to essential oils. Some firms engaged in the manufacture of chemical plant appear to have little idea of what is involved. Where essential oil development is being attempted over a wide area, a mobile unit, with boiler and still mounted on a truck and trailer, may be adopted, but this technique is not generally applicable to full scale production. The cost of the distillation unit as an overhead is proportionately lessened if several oil-bearing plants are cultivated which do not have the same harvesting periods so that the unit is in operation more continuously. Sometimes firms in the user countries may be willing to provide the capital for a distillation plant in exchange for a contract to purchase the oil over a period of several years.

(f) Two Considerations of General Importance.

9. Before considering some examples of the development of essential oils there are two general points concerning their production which must be mentioned. These are the importance of maintaining both the quality of the oil and the continuity of supply. Growers of the more usual crops are sometimes lured into producing essential oils by the high prices listed for many of them. High priced oils are difficult to produce for one reason or another, e.g. the plant itself may be difficult to grow, or the yield of oil may be extremely low. An expensive oil is expected to be of the highest quality. Too often a new grower will produce an oil, perhaps from plants harvested at the wrong time, or which has been badly distilled, and will express surprise because either he cannot sell it at all, or else he must dispose of it at a price well below the current market list. With regard to continuity of supply it must be remembered that a new oil is never exactly like one from an established source and a perfume manufacturer may have to revise his formulations or bring out a new composition in order to make use of it. Naturally he must be assured of continuity of supply for a number of years before he will undertake these changes.

(g) Examples of the Development of Essential Oil Production.

10. In conclusion it may be of interest to outline two developments of new sources of essential oils with which the Institute has been concerned.
- (i) Geranium Oil in Kenya
11. Geranium oil has been produced spasmodically in Kenya, and to a lesser extent in Tanganyika, since the beginning of this century, but the oils produced in these early years had low ester values and were weak in odour.
12. After the last war, however, one of the Institute's advisers in the trade pointed out that whilst some East African geranium oil was of good quality, it did not resemble the Bourbon type of oil which was in demand and he suggested that the Institute might obtain plants from Reunion for cultivation in Kenya. By arrangements made through official channels, cuttings of geranium were obtained from Reunion in exchange for seeds of the varieties of tea grown in Kenya. Of the original cuttings only two survived, but these were sufficient to establish the strain.
13. The first of the oils distilled from plants raised from these cuttings was favourably received by the trade, and since then the Institute has co-operated both with the Agricultural Department and private planters in analysing samples of oils and obtaining trade valuations.
14. Although the production of geranium oil in Kenya, which is centered round Lumbwa, fell during the years 1956-1958, conditions have improved since and the Bourbon strain, introduced in 1955, has been used increasingly

for new plantings. It was reported in East African Trade and Industry, January, 1961, that although Kenya's exports of the oil were then only about 2 tons, they could be increased to at least 10 tons and would then be worth something of the order of £100,000 to the country.

(11) Nindi Oil

15. In 1930, a farmer in Northern Rhodesia, sent to the Institute a sample of an essential oil, together with a specimen of the flower from which it had been distilled. The plant was found to be a new species of Leolanthus and the oil, known as nindi oil following the native name of the plant, was found to be a good source of geraniol, comparable with palma osa oil.
16. A few small batches of the oil were produced, and then in the late 1950's the plant came to the notice of the Development Commissioner from the Northern Province who, realising that such an indigenous plant might provide a useful cash crop for this difficultly accessible area, arranged for trial plantings to be made on the Agricultural Department's lands, whilst the help of the Institute was sought in finding an outlet for the oil.
17. Samples of oil aroused the interest of a leading firm of soap manufacturers and arrangements were made to produce the oil on a pilot-plant scale.
18. Since then a full scale distillation unit has been designed and this is now in operation in Northern Rhodesia. Provided that the quality of the oil is maintained and the price remains steady there should be a satisfactory outlet for this new product in the soap perfumery industry.

